

U.S. Serial No. 09/900,368
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REMARKS

The Office Action of April 22, 2004 has been received and reviewed. This response is directed to that action. In the Office Action, the Examiner rejected claims 1-5 under 35 U.S.C. §§ 102 and 103(a). Applicants have amended claim 1 to overcome these rejections. Support for this amendment can be found in the specification on page 2, lines 24-25 and page 2, lines 25-28.

Claim rejections - 35 U.S.C. § 102(b)

The Examiner rejected claims 1-4 under 35 U.S.C. § 102(b) as anticipated by Zievers et al (US 5,037,461). Zievers et al teaches a high temperature gas filter comprising a tank containing a plurality of tubular cylindrical filter sections disposed on metal plate and sealed within the tank. A fluid outlet is provided to carry the filtered fluid from the tank. The Examiner further stated that Zievers teaches a gas filter, but that since the filter is a porous ceramic, it is inherently permeable to liquids as well. The Applicants respectfully traverse this rejection.

The present invention, as currently amended, relates to a filter for use in a three phase slurry bubble column. Conversely, Zievers relates to a high temperature gas filter. This difference is critical to the function of a slurry bed for hydrocarbon synthesis reactions. Zievers teaches placing the manifold of his filters in a "tank" (see column 1, line 66), which is a common placement for gas filters. However, this placement for a catalyst filter would be unworkable in a slurry bubble column because such a configuration would remove the hydrocarbon synthesis catalyst from three phase communication, i.e., the gas phase. The catalyst would then become gas-starved, resulting in massive deactivation, thus rendering the catalyst useless. The open design of the present invention eliminates this problem.

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Moreover, the Examiner's assertion that the solid ceramic filter used in Zievers would function adequately in liquid operation is incorrect. Solid ceramic filters typically have very small pore sizes. This is ideal for gas filtration, but certainly not for liquid filtration because the ceramic filter leads to impracticably low liquid permeation rates. Also, ceramic filters are well-known to be very brittle. If used in a slurry reactor in a hydrocarbon synthesis reaction, the filters would likely break due to the strong vibrations in the reactor.

As clearly shown, the filter of Zievers would be impractical and unworkable in a three phase slurry bubble column. The Applicants have recognized the problems associated with solids filtration in a slurry, and have overcome these problems with the design of the present invention. Because Zievers does not teach or suggest the filter of the present invention, Applicants respectfully request that this rejection be withdrawn.

The Examiner also rejected claims 1-3 under 35 U.S.C. § 102(a) as anticipated by Sekellick (US 4,552,669). Sekellick teaches a filter comprising a plurality of hollow filter elements connected to a plate and cover and having a filtrate conduit for liquid flow, wherein the filter is mounted within a cylindrical shell. The Applicants respectfully traverse this rejection.

Similar to the design in Zievers, Sekellick also places the manifold of filters in a "shell" (column 8, lines 58-59). This also acts to remove the catalyst from three phase communication, resulting in a highly deactivated catalyst due to gas starvation. As stated previously in this response, the open design of the present invention prevents this problem.

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Sekellick's design is concerned with repeatably recleanable filter elements so as to prevent evacuating the reactor fluid and restarting the system in order to clean the filter. By overcoming these problems, Sekellick teaches flowing liquid from the inside to the outside of the filter tubes. This flow scheme results in the accumulation of solids as a cake inside the tube, which is especially problematic for filtering solids containing slurry. The design of Sekellick forces the filter surface to deal with the entire mass of catalyst. If used in a slurry bubble column, Sekellick's filter tubes would plug with catalyst and form a clay-like cake which would be impossible to backwash from inside the filter tubes. In contrast, the present invention incorporates vigorous cross-flow self-cleaning due to the turbulent action of large volumes of gas rising through the three phase slurry.

Consequently, the filter of Sekellick would not be suitable for use in a three phase slurry bubble column. Therefore, the present invention is not anticipated by Sekellick, and Applicants respectfully request that this rejection be withdrawn.

Claim rejections - 35 U.S.C. § 103(a)

The Examiner rejected claim 5 under 35 U.S.C. § 103(a) as obvious over Zievers in view of Sekellick. The Examiner stated that Zievers teaches all of the limitations of claims 1-4, and Sekellick teaches the further limitation of using sintered metallic filter elements, as in present claim 5.

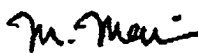
As argued previously, Zievers does not teach or suggest all of the limitations of claim 1 because the filter of Zievers not for use in a three phase slurry bubble column. Thus, all of the elements of claim 5 are not taught or suggested, and the rejection should be withdrawn.

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The Applicants believe the claims are in condition for allowance, and respectfully request that the Examiner take such action. If any issues remain, the resolution of which may be advanced by a telephone conference, the Examiner is invited to contact the Applicants' attorney at the number listed below.

Respectfully submitted,



Mark D. Marin
Attorney for Applicants
Registration No. 50,842
Telephone Number: (908) 730-3271
Facsimile Number: (908) 730-3649

☒ Pursuant to 37 CFR 1.34(a)

ExxonMobil Research and Engineering Company
P. O. Box 900
Annandale, New Jersey 08801-0900

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